

REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the pending application. The Final Office Action dated March 11, 2011 has been received and their contents carefully reviewed.

Claims 1 and 11 are hereby amended. Claim 8 is canceled without prejudice or disclaimer. Support for the claim amendment can be found, for example, at *Specification*, page 20, lines 10-14. No new matter has been added. Accordingly, claims 1-7, 9, and 11 are currently pending. Reexamination and reconsideration of the pending claims are respectfully requested.

The Office Action rejects claims 1-2, 5-7, 9, and 11 under 35 U.S.C. §103(a) as being obvious over “Nanofabrication of Organic/Inorganic Hybrids of TiO₂ with Substituted Phthalocyanine or Polythiphene” to Ding (*Ding*) in view of “Polymer brushes: surface-immobilized macromolecules” to Zhao (*Zhao*). Applicants respectfully traverse the rejection.

In order to establish *prima facie* obviousness of the claimed invention, all the elements must be taught or suggested by the prior art. The combined teachings of *Ding* and *Zhao* fail to teach each and every element of claims 1-2, 5-7 and 11, and thus, cannot render these claims obvious.

Amended claim 1 recites, “functionalizing said substrate by chemical grafting of one or more compounds containing at least one group that can be polymerized with one or more precursors of an electrically conducting polymer and at least one group able to be chemically grafted onto said substrate in the presence of one or more chromophores, the one or more compounds and the one more chromophores being brought into contact with said substrate, and the one or more compounds and the one more chromophores being grafted to said substrate.”

Ding fails to teach or suggest at least these elements of claim 1. *Ding* discloses “[t]he application of organic dye-sensitized titanium dioxide (TiO₂) nanoparticles to a new type of photovoltaic cell.” *Ding*, page 207, left column. *Ding* further discloses “[i]n addition to dye molecules, TiO₂ can also be sensitised by conducting polymers and other inorganic semiconducting oxides.” *Id.* Note that *Ding* teaches that **either** organic dye **or** conducting polymers and other inorganic semiconducting oxides can be used to sensitising TiO₂. There is no teaching or suggestion in *Ding* that **both** the organic dye **and** conducting polymers could be used together to sensitising TiO₂. Thus, *Ding* does not teach or suggest “the one or more

compounds and the one more chromophores being grafted to said substrate,” as required by claim 1.

Zhao does not cure the deficiency of *Ding*. *Zhao* is also silent with respect to the above-recited element of claim 1. Accordingly, claim 1 is allowable over the combined teachings of *Ding* and *Zhao*. Claims 2, 5-7, and 11 variously depend from claim 1, and are also allowable for at least the same reasons as claim 1. Applicants, therefore, respectfully request withdrawal of the rejection of claims 1-2, 5-7, and 11.

The Office Action rejects claims 3-4, 8, and 11 under 35 U.S.C. §103(a) as being obvious over *Ding* and *Zhao* and further in view of “A low cost, high efficiency solar cell based on dye sensitized colloidal TiO₂ films” to *O’regan* (*O’regan*). Claim 8 is canceled, so the rejection of claim 8 is moot. Applicants’ respectfully traverse the rejection of the remaining claims.

Claims 3, 4, and 11 variously depend from claim 1 and incorporate all the elements of claim 1. As discussed, the combined teaching of *Ding* and *Zhao* fails to teach or suggest at least the above-recited elements of claim 1, namely, “functionalizing said substrate by chemical grafting of one or more compounds containing at least one group that can be polymerized with one or more precursors of an electrically conducting polymer and at least one group able to be chemically grafted onto said substrate in the presence of one or more chromophores, the one or more compounds and the one more chromophores being brought into contact with said substrate, and the one or more compounds and the one more chromophores being grafted to said substrate.” *O’regan* does not cure the deficiencies of *Ding* and *Zhao*. *O’regan* is also silent with respect to the above-recited elements of claim 1.

The Office states that *O’regan* discloses the dye molecules give rise to electron injection into the semiconductor and it would have been obvious to one of ordinary skill in the art to use both dye and polymer to sensitize the semiconductor. *Office Action*, page 6. Applicants respectfully disagree. *O’regan* identifies that one problem for photo cells is poor light harvesting. *O’regan*, page 738. Specifically, “a monomolecular layer of sensitizer absorbs less than 1% of incident monochromatic light.” *Id.* To solve this problem, *O’regan* discloses using nanometer-sized TiO₂ together with newly developed charge-transfer dyes to obtain efficient light harvesting. *Id.* If one were to use both dye and polymer to sensitize the semiconductor as suggested by the Office, it would result in **less dye** on the substrate and

consequently **poorer light harvesting**. Because *O'regan* expressly teaches how to improve light harvesting and the use of both dye and polymer would result in poorer light harvesting, it would be not reasonable to one of ordinary to combine the teaching of *Ding*, *Zhao*, and *O'regan* to arrive at the claimed invention.

Accordingly, claims 3, 4, and 11 are allowable over the combined teaching of *Ding*, *Zhao*, and *O'regan*. Applicants, therefore, respectfully request withdrawal of the rejection of claims 3, 4, and 11.

The application is in condition for allowance and early, favorable action is respectfully solicited. If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at (202) 496-7500 to discuss the steps necessary for placing the application in condition for allowance. All correspondence should continue to be sent to the below-listed address.

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911. A duplicate copy of this sheet is enclosed.

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Respectfully submitted,

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